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10/543,121	07/22/2005	Gilbert Bouquet	62723A	4365

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EXAMINER	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/543,121
Filing Date: July 22, 2005
Appellant(s): BOUQUET ET AL.

M. Robert Christy
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed June 24, 2008 appealing from the Office action mailed January 25, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,721,320	Priddy et al.	02-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-13 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Priddy et al U.S. Patent 5,721,320 in view of EP 0 892 820.

Independent claim 1 and dependent claims 2-13 and 17-19 claim a mass/solution polymerization process utilizing a functionalized rubber to produce a rubber modified polymer from a vinyl aromatic monomer comprising polymerizing the vinyl aromatic monomer in the presence of a rubber, wherein the rubber comprises a functionalized diene rubber having: (a) a solution viscosity of from 5 to less than 50 centipoises (cps), and (b) at least one functional group per rubber molecule which enables controlled radical polymerization; such that grafted rubber particles are formed and dispersed within a matrix comprising polymerized vinyl aromatic monomer and have a broad monomodal size distribution.

Priddy discloses a process for producing ABS copolymer by polymerizing a vinyl aromatic monomer in the presence of a diene rubber using a stable radical compound by emulsion polymerization process in the presence of solvent, column 5, lines 59-67;

column 6, lines 1-60 and column 7, lines 24-44. The stable free radical reacts with the diene monomer or rubber and the polymer chain contains a stable free radical group, column 2, lines 37-40 and column 6, lines 32 and 47-53, for the present claims 1, 6-9. The polybytadiene has pendant nitroxyl functional groups, for the present claims 7-8. The functionalizing diene rubber is readable in Priddy invention, column 7, lines 57-65. The stable free radical such as 2,2,6,6-tetramethyl-1-piperidenyl-1-oxy (TEMPO), column 6, lines 24-25 and column 8, lines 23 and 40, is readable in the present claim 8. The rubber is functionalized before introducing polymerized styrene and/or acrylonitrile, for the present claim 1. A nitroxy terminated polyisoprene is able to control radical polymerization, for the present claim 1. The chain transfer agent can be present, column 7, lines 53-56, for the present claims 11 and 13. Initiators such as free radical initiators are present, column 7, lines 1-23, for the present claims 12-13. A solvent is used in the process to improve the processability and heat transfer during polymerization, column 7, lines 24-42. Styrene monomer and/or acrylonitrile are polymerizing in the presence of a nitroxy terminated polybutadiene, column 8, lines 41-43. Styrene monomer and acrylonitrile are grafted onto the rubber particles. Styrene and/or acrylonitrile monomer(s) form a matrix phase, column 7, lines 57-61, for the present claims 2-3. The rubber reinforced polymer can be prepared by dissolving the diene rubber containing a stable free radical group in a vinyl aromatic monomer and polymerizing the rubber/monomer mixture. The process can be conducted using conventional techniques known in the art for preparing rubber reinforced polymers such as high impact polystyrene (HIPS) and ABS, column 6, lines 54-62. The grafted

polymer has a Mw in the range of 15000 to 150000, column 8, lines 1-14. The average rubber particles size is less than 0.1 micron=100 nm. In the working example 1 at column 10, the polybutadiene has Mw of 3,930. The resulting product is transparent impact polystyrene, column 10, line 40. The resulting product can be used in a variety of applications, column 8, lines 10-17, for the present claim 19.

Priddy does not disclose the claimed solution viscosity of from 5 to less than 50 centipoises in the present claim 1. Priddy does not mention the claimed solution viscosity of from 5 to less than 50 cps in the present claim 1. However, Priddy does disclose solution polymerization of butadiene and terminating with a nitroxide containing compound, column 10, line 8. The average rubber particles size is less than 0.1 micron=100 nm. (The small particle size of the dispersed rubber in the polymer matrix is a benefit to impart gloss property of the resulting product, that is discussed in EP 0 892 820 below).

EP'820 discloses rubber-modified polystyrene. EP'820 discloses a mass/solution polymerization polybutadiene in the presence of solvent. The particle size of the rubber particles produced in the first and second prepolymer composition can be influenced by a number of factors including the rubber used, the amount of grafting, the viscosity and the shear rate. The techniques of mass-polymerization and the conditions needed for producing the desired average particle sizes are well known to one skilled in the art, page 4, lines 48-51. The process can be used to produce monomodal composition, page 4, line 52. In monomodal composition the volume average particle size are from 0.05 to 10 micrometers, page 4, line 55. The process condition is conducted in an a

reactor equipped with a variable speed agitator set at an agitation rate of 50 rpm, page 6, lines 9-19. EP'820 does disclose a broad monomodal size distribution for the present claim 1, page 5, lines 1-17. For product which requires high gloss properties, the amount of small particles is from 85-98%, page 5, line 15. The size of the rubber particles are depending upon the desired gloss and impact properties of the polymer product, page 5, lines 40-41. The resulting product is useful in a wide variety of applications, page 5, lines 50-56.

Both references disclose analogous process conditions for producing rubber modified polymers from vinyl aromatic monomers.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a process for producing a functionalized rubber having particles size of 100 nm and grafting said rubber particles with vinyl aromatic monomer in Priddy invention wherein the small particles of rubber is a benefit to impart high gloss properties as evidence in EP'820; and since reference discloses the analogous process condition, a bulk/solution polymerization, a small rubber particles that impart high gloss property of the obtained product and a broad range of molecular weight of the functionalized polybutadiene, the claimed solution viscosity is expected to provide adequate results, wherein or not these property is shown or suggested in the prior art. In re Spada, 911 F, 2d 705, 709 15 USPQ 1655, 1658 (Fed. Cir.1990).

(10) Response to Argument

The claimed invention is a mass/solution polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber, having a solution viscosity of from 5 to less than 50 centipoise (cps) wherein the functional group on the rubber enables controlled radical polymerization such that the resulting graft rubber particles have a broad monomodal size distribution, (page 9).

(A) The argument presented by Appellants is that Priddy is silent as to a solution viscosity of the functionalized rubber and to the rubber particle size distribution, page 9.

(B) EP 0 892 820 discloses a process for preparing modified polymers from vinyl aromatic monomers wherein the rubber has a bimodal particle size distribution. EP 0 892 820 is silent as to the viscosity of the rubbers used in its process, page 9.

(C) Appellants assert that it is impossible for one skilled in the art to combine Priddy with EP 0 892 820 to arrive at Applicant's invention of a polymerization process comprising polymerizing a vinyl aromatic monomer in the presence of a functionalized diene rubber having a solution viscosity of from 5 to less than 50 centipoise because neither disclose anything about rubber solution viscosity. Appellants argue that neither Priddy nor EP 0 892 820 teach or suggest any viscosity limitations regarding the rubber used in their respective inventions, (page 9).

Priddy does discloses a bulk (mass) **solution polymerization** of butadiene and terminating said polybutadiene with a nitroxide containing compound, column 10, line 8. Thus, a **solution viscosity of rubber is inevitably present**. Priddy does not mention

a solution viscosity within the claimed range of 5 to less than 50 cps, however, Priddy does not exclude a low solution viscosity of the functionalized polybutadiene. Appellants disclose that smaller rubber particle is the key in achieving transparency in rubber-modified polymer. Priddy's examples to make a transparent polymers using ultra low Mw rubber oligomers teaches away from Applicant's rubber which would have a much higher Mw as evidenced by the relationship in Figure 1 (in the Affidavit, page 3) and having a solution viscosity range of from 5 to less than 50, page 10, second paragraph.

Appellants know that Priddy discloses rubber with Mw of between 20,000 to 300,000, most preferably 100,000 to 150,000. However, one cannot rely solely on rubber Mw to predict its solution viscosity, page 10, third paragraph. Because, the viscosity of a rubber is a functional of more than just its molecular weight, therefore, one skilled in the art cannot predict whether the molecular weight rubbers of Priddy will fall within the Applicant's selected range, page 10, third paragraph.

Priddy discloses rubber particles having a volume average particle size of less than 100 nanometers. The small rubber particles of less than 100 nm in Priddy invention are a benefit to impart high gloss properties for products that is evidence in the secondary reference to EP'820. The claimed solution viscosity is expected to provide adequate results, whether or not this property is shown or suggested in the prior art. *In re Spada*, 911 F, 2d 705, 709 15 USPQ 1655, 1658 (Fed.Cir. 1990). The preferred embodiments of the Mw of the rubber to not constitute a teaching away from non preferred embodiments in the disclosure in Priddy invention. *In re Susi*, 440 F.2d 442,

169 USPQ 423 (CCPA 1971). First of all, simply because the reference is silent as to some property of the solution polymerization, does not mean that that property is not expected in Priddy invention. Priddy discloses molecular weight of rubber and small particle size. The property of the resulting product is transparent impact polystyrene, column 10, line 40. Priddy discloses a gloss property of the resulting resin. The key of the Priddy invention is to produce fine rubber particle size in the mass solution polymerization process. Thus, Priddy knows how to control solution polymerization process for obtaining particle size in the range less than 0.1 micron.

There is no Mw of rubber in the present claims. To analyze Mw, the present specification at page 8, line 5 discloses the Mw that is overlapped in the range of Mw of rubber in Priddy invention.

The Appellants are referring to the Gilbert C. Bouquet Affidavit under 37 CFR 1.132 submitted with Appellants' Response to the Office submitted November 05, 2007 and this Affidavit is re-submitted herewith as Exhibit A.

The inventor presents a correlation between molecular weight (Mw) and solution viscosity for butadiene rubbers, wherein the rubbers used in the Examples of the present application 10/543,121 have molecular weights that overlapped in the range limitation of the molecular weight of rubber in Priddy invention, although, there is no molecular weight of rubber in the present claims. The inventor presents data to show how the solution viscosity is depending on the molecular weight for obtaining the desired gloss property of an ABS, page 3. The desired property is a high gloss value of

the resulting product. **Inventor does not disclose the relation between a low solution viscosity and rubber particle size**. The inventor is focusing on the Mw of 3930 in the working example in Priddy at column 10, line 16, and concludes that the rubber with a Mw of 3930 kg/mole would have a solution viscosity significantly lower than 5 cps., page 5 in the Affidavit; and page 10, first paragraph in the argument. **In the Affidavit the inventor does not present the relation between the analogous Mw of rubber having fine particle size of less than 0.1 micron=100 nm in Priddy invention and solution viscosity.**

Referring to EP 0 892 820 reference discloses a process for preparing rubber modified polymer from vinyl aromatic monomers. EP'820 does disclose a mass/solution polymerization polybutadiene in the present of solvent. The volume average particle size is from 0.05 to 10 micrometers, page 4, line 55. The size of the rubber particles is depending upon the desired gloss and impact properties of the polymer product, page 5, line 41. EP'820 discloses fine rubber particles to impart gloss property of the resulting resin. EP' 820 discloses controlling process conditions including temperature, time, and dosage of monomer with a **variable speed agitator set** at an agitation rate of 50 rpm, page 6. EP'820 does disclose solution polymerization upon controlling agitation rate for producing fine rubber particles that impart high gloss property of the resulting resin.

The present claims does not disclose the process condition how to produce the low solution viscosity of a rubber.

Both references disclose analogous process conditions for producing rubber modified polymers from vinyl aromatic monomers. The teachings of these references are properly combined. Both references disclose fine rubber particles. The desired/claimed low solution viscosity is depending on the fine rubber particles produced under controlled agitation rate condition.

The argument that one skilled in the art cannot predict whether the molecular weight rubber of Priddy will fall within the Applicant's selected range is not persuasive.

Appellant does not present evidence for relation between the analogous Mw of rubber in Priddy invention and the present Mw in the present specification and fine rubber particle in Priddy. There is no evidence that the analogous Mw of rubber having fine particle size will not have analogous solution viscosity.

Inventor does not present evidence for the relation between the analogous Mw of rubber having fine particle size of less than 0.1 micron=100 nm in Priddy invention and solution viscosity.

The Affidavit fails to present comparative data for all the prior art references relied upon as grounds of rejection.

The invention as claimed is still considered to have been unpatentable over the teachings of the cited prior art.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Gulakowski, Randy

/Randy Gulakowski/

Supervisory Patent Examiner, Art Unit 1796

August 19, 2008

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